University of Agronomic Sciences and Veterinary Medicine of Bucharest
Faculty of Horticulture

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Preliminary research on the organic management of foliar pathogens in the edible climbing rose

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Introduction

Edible climbing rose culture:

- Food
- Medicine
- Cosmetics

Importance of using organic technology

Falstaff

Brother Cadfael

Crown Princess Margareta

Objectives

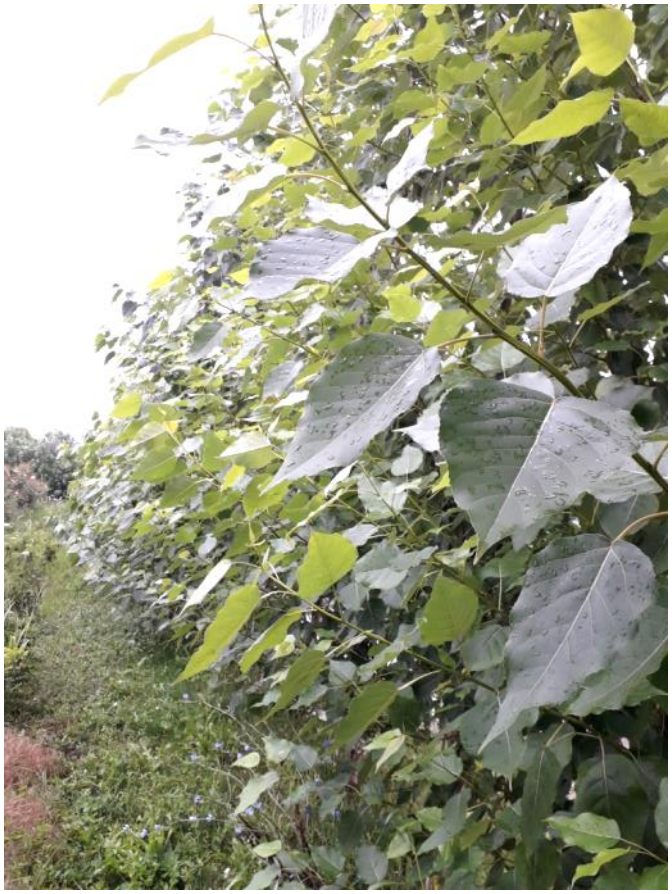
- Monitoring
- Identification
- Prevention and control methods
- Leaf microflora associated with pathogens

- *Diplocarpon rosae (Fabraea rosae, Marssonina rosae)* – black spot of roses
- *Podosphaera pannosa (Sphaerotheca pannosa var. rosae)* – powdery mildew of rose

Materials and Methods

Biological material

- Edible climbing roses: Falstaff, Brother Cadfael, Crown Princess Margareta
- Planting distances: 2.0 x 1.0 m
- Year of plantation: 2015
- Organic technology
- Windbreaks (*Populus balsamifera*)



Materials and Methods

Protection scheme - 2020

Period	Treatment
25.02	Bouille bordelaise (BB) 1% + Ovipron 0.5%
16.04	BB 0.5%, Oleorgan 0.3%, Folarex 0.3%
30.07	BB 0.5%, Sodium bicarbonate 0.5%, Folarex 0.45%, Garex 0.2%
11.08	BB 0.5%, Sodium bicarbonate 0.5%, Folarex 0.45%, Garex 0.2%, Milk 1%
21.08	BB 0.5%, Sodium bicarbonate 0.5%, Folarex 0.45%, Garex 0.2%, Milk 0.75%
31.08	BB 0.5%, Sodium bicarbonate 0.5%, Folarex 0.45%
12.09	BB 0.5%, Sodium bicarbonate 0.5%, Folarex 0.45%
21.09	BB 0.5%, Sodium bicarbonate 1.0%, Folarex 0.45%
02.10	BB 0.5%, Microthiol 0.5%, Folarex 0.45%
20.10	BB 0.5%, Microthiol 0.6%, Folarex 0.45%

Materials and Methods

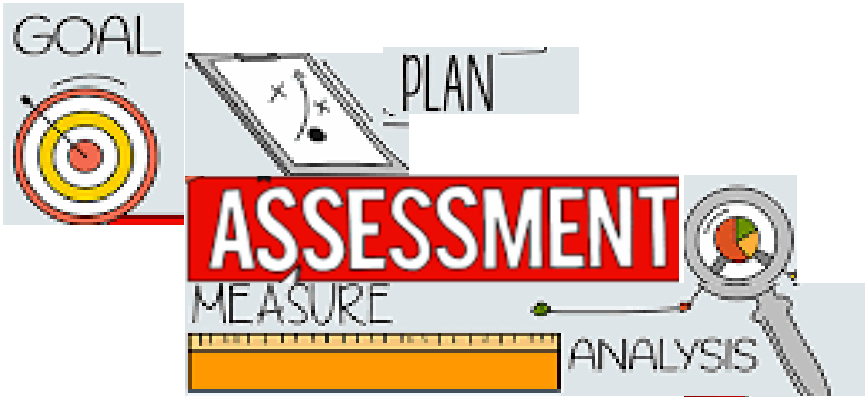
Assessment of disease incidence (%), disease severity (%) and attack degree (%)

Disease incidence - DI (%)
Leaves with disease symptoms/total leaves observed x 100

Disease severity – DS (%)
Black spot and powdery mildew severity were rated rated on 1 to 6 classes

DS(%) = ∑(i x f) /n, where **i** = class or disease severity(%); **f** = number of leaves observed in this category; **n** = total number of leaves with symptoms

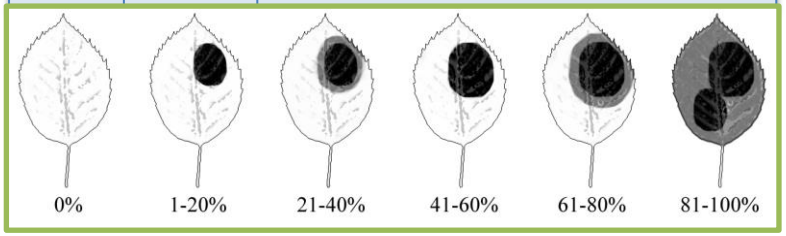
Attack degree – AD (%)
DI x DS/100



Materials and Methods

Assessment of disease incidence (%), disease severity (%) and attack degree (%)

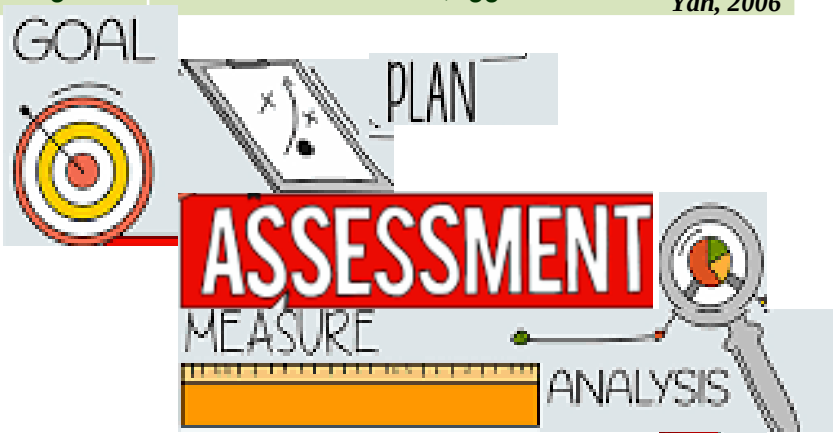
Class/ scale	Disease severity (%)	Black spot symptoms description
1	0	Leaflet with no black spot symptoms
2	1-20	Leaflet with black spots having size less than 5 mm. No yellowing of leaflet and no premature defoliation
3	21-40	Leaflet with black spots having less than 5 mm size along with yellowing and/or defoliation symptoms
4	41-60	Leaflet with black spots having 5-10 mm size with no yellowing and/or defoliation symptoms
5	61-80	Leaflets with black spots of 5-10 mm along with yellowing and/or defoliation symptoms
6	81-100	Leaflets with black spots of more than 10 mm along with yellowing and/or defoliation symptoms



Yasin et al., J Hortic 2016, 3:4

Class/scale	Powdery mildew severity [%]
0	Leaflet with no powdery mildew symptoms
1	< 1
2	1-5
3	6-20
4	21-40
5	41-60
6	> 60

Yan, 2006



Materials and Methods

Leaves microbiota: isolation and identification

Healthy or infected rose leaves with black spot or powdery mildew symptoms were collected. The leaves were cut into small pieces (0.5cm, surface sterilized using 70% ethanol and rinsed for three times. The leaves tissues were blotted dried and plated on potato dextrose agar (PDA). Plates were incubated at 22°C until growing of colonies. Pure culture of isolates was acquired through subsequent sub-culturing on PDA plates

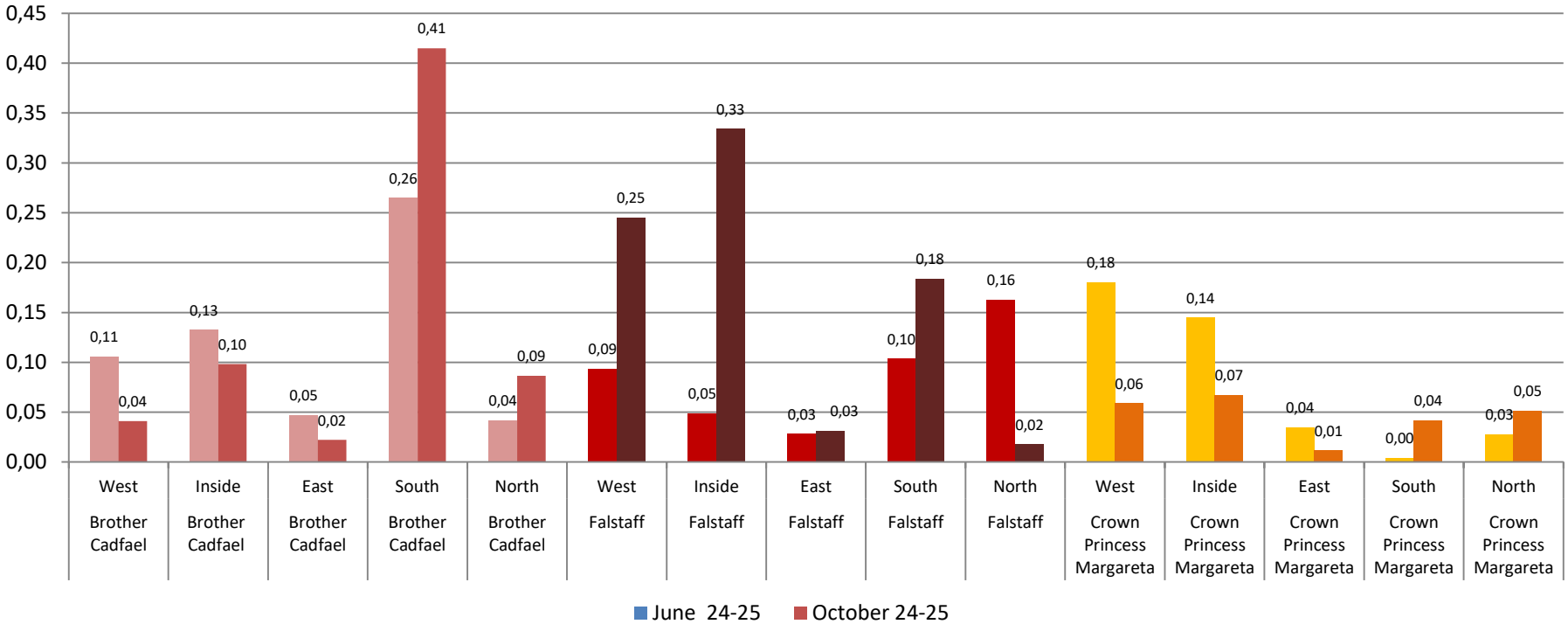
Morphological identification

Fungal isolates were identified based on their macroscopic (colony colour, pigmentation) and microscopic characteristics.

Isolates incidence (%)

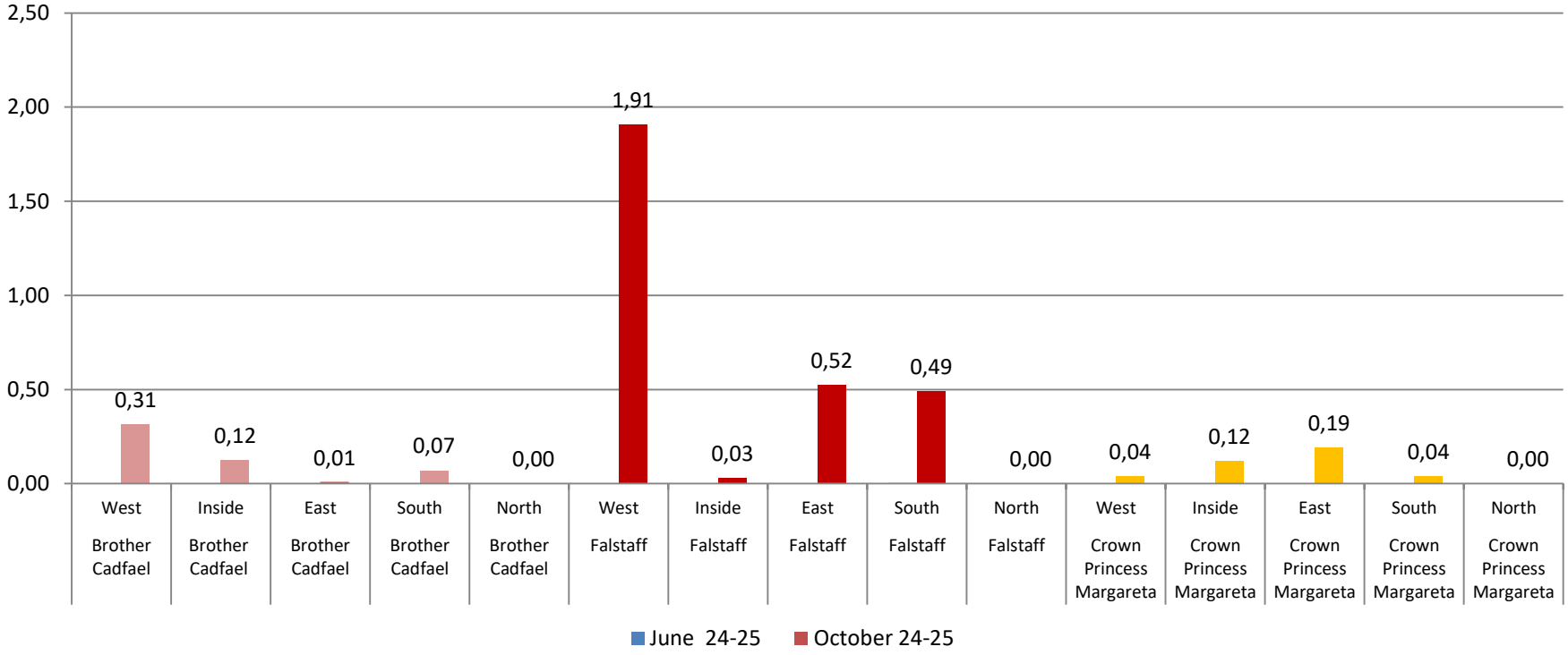
Results and discussions

Influence of protection scheme and organic technology on Diplocarpon rosae attack



Results and discussions

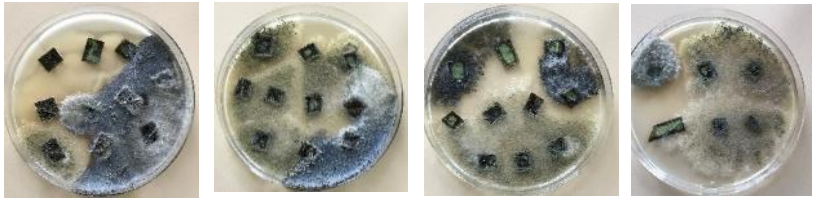
Influence of protection scheme and organic technology on Podosphaera pannosa attack



Results and discussions

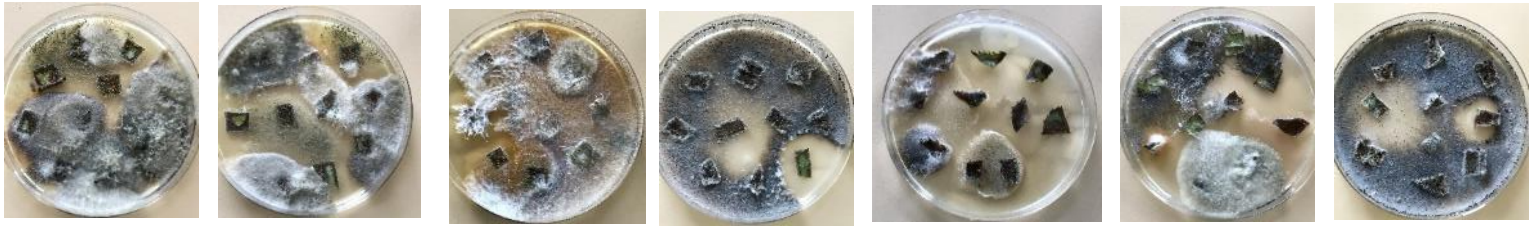
Microbiota associated with healthy or diseased rose leaves

	Alternaria	Cladosporium	Chaetomium	Epicoccum	Fusarium	Monilia	Sordaria	Levuri	Bacterii
healthy leaves	2	0	48	0	2	0	13	17	0



Isolates incidence (%)
july 2020

	Alternaria	Cladosporium	Chaetomium	Epicoccum	Fusarium	Monilia	Sordaria	Levuri	Bacterii
black spot	18	0	6	0	8	0	22	6	0



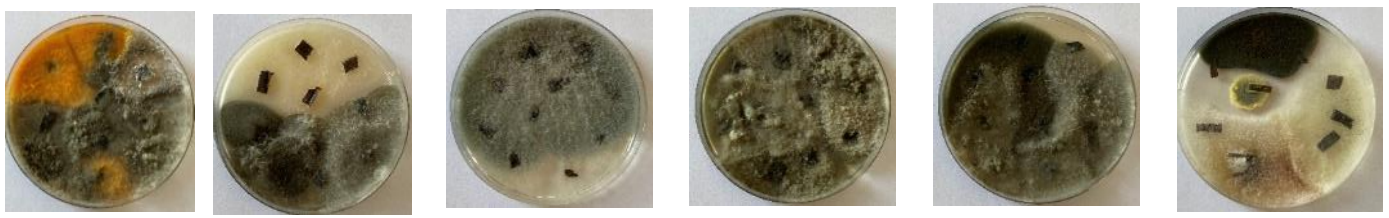
	Alternaria	Cladosporium	Chaetomium	Epicoccum	Fusarium	Monilia	Sordaria	Levuri	Bacterii
powdey mildew	18	0	21	0	14	10	49	28	8

Results and discussions

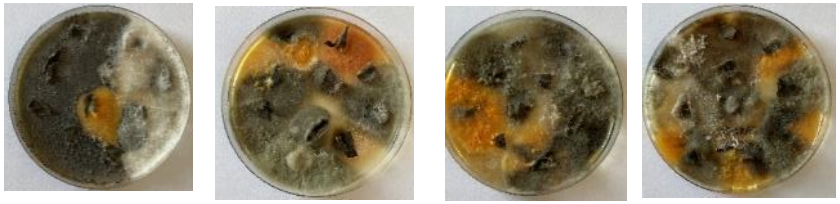
Microbiota associated with rose healthy or diseased leaves

	Alternaria	Cladosporium	Epicoccum	Penicillium	Bacteria
healthy leaves	25	3	3	0	3

	Alternaria	Cladosporium	Epicoccum	Penicillium	Bacteria
black spot	84	0	3	3	7



	Alternaria	Cladosporium	Epicoccum	Penicillium	Bacteria
powdey mildew	67	0	27	0	0



Isolates incidence (%)
novembre 2020

Results and discussions

Microbiota associated with rose healthy or diseased leaves

Isolates	Healthy leaves		Black spot leaves		Powdery mildew leaves	
	July	November	July	November	July	November
Alternaria						
Cladosporium						
Chaetomium						
Epicoccum						
Fusarium						
Monilia						
Penicillium						
Sordaria						
Yeasts						
Bacteria						

Conclusions and recommendations

Rose is susceptible to a large number of diseases that impact significantly on their performance and commercial value. Among the most important pathogens that damage the aerial tissues of the plant are *Diplocarpon rosae (black spot)* and *Podosphaera pannosa* (powdery mildew).

Black spot and powdery mildew infection occurred naturally. Our protection treatment scheme reduced black spot and powdery mildew attack to low levels. Phytotoxicity, chlorosis, defoliation, discoloration or stunting were not observed in any of the treated plants.

A preliminary study on the phylloplane microbiota of rose was carried out. The microbial community associated with healthy or diseased rose leaves was represented by *Alternaria*, *Cladosporium*, *Chaetomium*, *Epicoccum*, *Fusarium*, *Penicillium* and *Sordaria* isolates. Some of these fungi can act as antagonists against various plant pathogens.

The composition and incidence of fungal isolates was variable in time as weel as in presence or absence of *Diplocarpon rosae* or *Podosphaera pannosa* pathogens. Further studies are needed to better understand how the composition and diversity of a microbial community can interacts or influence the pathogens.

Our study highlights the presence of *Chaetomium globosum*, *Epicoccum purpurascens* and *Sordaria fimicola* isolates with antagonistic properties. Further studies will focus on their antagonistic properties and colonizing ability on the phylloplane (*in vitro* and *in vivo* assays)

Our further studies will contribute to a better understanding the composition and diversity of a rose phylloplane microbial community and how these microbiota can influence the pathogens.

Thank you for your attention!